

WHAT IS CLAIMED IS:

1. A light wavelength conversion module comprising:
- (a) a light wavelength conversion element formed of a wavelength conversion crystal, said light wavelength conversion element being for converting a wavelength of a fundamental wave, said light wavelength conversion element having an end surface;
 - (b) a semiconductor laser for emitting a laser beam for entering said light wavelength conversion element as the fundamental wave; and
 - (c) a transmission type wavelength selecting optical element disposed between said semiconductor laser and said light wavelength conversion element, said wavelength selecting optical element selecting a wavelength of the laser beam which is reflected by an end surface of said light wavelength conversion element and is to be fed back to said semiconductor laser.

2. A light wavelength conversion module comprising:
- a light wavelength conversion element formed of a bulk-shaped wavelength conversion crystal, said light wavelength conversion element converting a wavelength of a fundamental wave;
 - a semiconductor laser emitting a laser beam which is to enter said light wavelength conversion element as the

fundamental wave;

A
a light separating device for separating a part of the laser beam before the laser beam enters into said light wavelength conversion element;

a reflecting member reflecting the separated laser beam so as to feed back the separated laser beam to said semiconductor laser; and

a transmission type wavelength selecting optical element selecting a wavelength of the laser beam which is to be fed back to said semiconductor laser.

3. A light wavelength conversion module comprising:

a light wavelength conversion element formed of a bulk-shaped wavelength conversion crystal, said light wavelength conversion element converting a wavelength of a fundamental wave;

a semiconductor laser emitting a laser beam which is to enter said light wavelength conversion element as the fundamental wave;

a reflecting member reflecting the laser beam which is emitted from said light wavelength conversion element and is to be fed back to said semiconductor laser; and

a transmission type wavelength selecting optical element which selects a wavelength of the laser beam which is to be fed back to said semiconductor laser.

4. A light wavelength conversion module according to claim 3, further comprising an optical system which separates a wavelength-modulated wave from the laser beam emitted from said light wavelength conversion element.

See Fig.
5. A light wavelength conversion module comprising:
a light wavelength conversion element formed of a bulk-shaped wavelength conversion crystal, said light wavelength conversion element converting a wavelength of a fundamental wave;

a semiconductor laser emitting a laser beam which is to enter said light wavelength conversion element as the fundamental wave;

a reflecting member reflecting a laser beam emitted from said semiconductor laser as a backward emitted light, which is directed in a direction other than toward said light wavelength conversion element, so as to feed back the laser beam to said semiconductor laser; and

a transmission type wavelength selecting optical element which selects a wavelength of the laser beam which is to be fed back to said semiconductor laser.

6. A light wavelength conversion module comprising:
a light wavelength conversion element formed of a bulk-

shaped wavelength conversion crystal, said light wavelength conversion element converting a wavelength of a fundamental wave;

a semiconductor laser emitting a laser beam which is to enter said light wavelength conversion element as the fundamental wave; and

a reflection type wavelength selecting optical element disposed between said semiconductor laser and said light wavelength conversion element, said wavelength selecting optical element reflecting a part of said laser beam so as to feed back the part of the laser beam to said semiconductor laser and selecting a wavelength of the part of the laser beam to be fed back.

7. A light wavelength conversion module comprising:
a light wavelength conversion element formed of a bulk-shaped wavelength conversion crystal, said light wavelength conversion element converting a wavelength of a fundamental wave;

a semiconductor laser emitting a laser beam which is to enter said light wavelength conversion element as the fundamental wave; and

a reflection type wavelength selecting optical element which reflects a laser beam which has exited from said light wavelength conversion element so as to feed back the laser beam to said semiconductor laser, and which selects a wavelength of the laser

beam to be fed back.

- Sub
13
112
- 8. A light wavelength conversion module according to claim 7, further comprising an optical system which separates a wavelength-modulated wave from the laser beam which has exited from said light wavelength conversion element.

- 9. A light wavelength conversion module comprising:
a light wavelength conversion element formed of a bulk-shaped wavelength conversion crystal, said light wavelength conversion element converting a wavelength of a fundamental wave;
a semiconductor laser emitting a laser beam which is to enter said light wavelength conversion element as the fundamental wave; and
a reflection type wavelength selecting optical element which reflects a laser beam emitted from said semiconductor laser as a backward emitted light, which is directed in a direction other than toward said light wavelength conversion element, so as to feed back the laser beam to said semiconductor laser, and which selects a wavelength of the laser beam to be fed back.

10. A light wavelength conversion module according to claim 1, wherein said wavelength selecting optical element is a narrow band-pass filter.

11. A light wavelength conversion module according to claim 10, wherein said narrow band-pass filter is a thin film type band pass filter.

— 12. A light wavelength conversion module according to claim 11, wherein said thin film type band pass filter is formed on a light emitting end surface of said semiconductor laser.

13. A light wavelength conversion module according to claim 10, wherein said narrow band-pass filter is a birefringent filter.

112 14. A light wavelength conversion module according to claim 2, wherein said transmission type wavelength selecting optical element is a thin film type narrow band-pass filter, said band pass filter being formed on a surface of said reflecting member.

15. A light wavelength conversion module according to claim 1, wherein said wavelength selecting optical element is a bulk grating.

— 16. A light wavelength conversion module according to claim 6, wherein said reflection type wavelength selecting optical element is a fiber grating made of an optical fiber, a plurality of refractive index changing portions being formed at regular

conversion element and fed back to said semiconductor laser.

20. A light wavelength conversion module comprising:
- a light wavelength conversion element formed of a bulk-shaped wavelength conversion crystal, said light wavelength conversion element converting a wavelength of a fundamental wave;
 - a semiconductor laser coupled to an end surface of said light wavelength conversion element and emitting a laser beam which is to enter said light wavelength conversion element as the fundamental wave; and
 - a reflection type thin film narrow band-pass filter disposed between a light emitting surface of said semiconductor laser and an end surface of said light wavelength conversion element, said thin film narrow band-pass filter reflecting a part of the laser beam so as to feed back the part of the laser beam to said semiconductor laser, and selecting a wavelength of the part of the laser beam to be fed back.

21. A light wavelength conversion module according to claim 1, wherein said bulk-shaped wavelength conversion crystal is one of the following compositions:

- i) LiNbO_3 doped with MgO or ZnO ; or
- ii) LiTaO_3 , LiNbO_3 , LiTaO_3 , KTiOPO_4 , KNbO_3 doped with MgO or ZnO .

22. A light wavelength conversion module according to claim 1, wherein said bulk-shaped wavelength conversion crystal is a periodic domain reversing crystal on which domain reversing segments having reversed directions of spontaneous polarization are formed periodically, said periodic domain reversing crystal converting the wavelength of the fundamental wave guided in a direction along which said domain reversing segments are aligned.

— 23. A light wavelength conversion module according to claim 1, wherein said semiconductor laser is a high power semiconductor laser which has an output power of 300 mW or more.

112 24. A light wavelength conversion module according to claim 1, wherein said semiconductor laser is a semiconductor laser which emits the laser beam in a single-peak spatial mode.

25. A light wavelength conversion module according to claim 1, further comprising a light modulation device for modulating the intensity of the laser beam which has exited from said light wavelength conversion element.

— 26. A light wavelength conversion module according to claim

1, further comprising a light modulation device for modulating the intensity of the laser beam which has exited from said light wavelength conversion element, by changing a driving current of said semiconductor laser to modulate the intensity of the fundamental wave emitted from said semiconductor laser.

27. A light wavelength conversion module according to claim 1, further comprising a light modulation device for modulating the pulse of said laser beam which has exited from said light wavelength conversion element.

28. A light scanning and recording apparatus comprising:
a light wavelength conversion module comprising a light modulation device for modulating the intensity or the pulse of a recording light on the basis of image signals expressing an image of a continuous tone, and a light wavelength conversion device for, by a nonlinear optical effect, converting the wavelength of the recording light whose intensity or pulse has been modulated; and
a scanning device for scanning a recording material with the recording light whose wavelength has been converted,
wherein said light scanning and recording apparatus utilizes the light wavelength conversion module according to claim 25 as said light wavelength conversion module.

Doc
A4